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EXAMINER

WILKINS III, HARRY D

ART UNIT

PAPER NUMBER

1742

DATE MAILED: 10/01/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/090,444

Applicant(s)

DENVIR ET AL.

Examiner

Harry D Wilkins, III

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-36 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-18 and 26-36 is/are rejected.
- 7) ☒ Claim(s) 6-9, 12, 14, 19-25, 29, 30, 32 and 36 is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 04 March 2002 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☒ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 4, 6.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Claim Objections

1. Claims 6-9, 12, 14, 21, 29, 30, 32 and 36 are objected to because of the following informalities: each of these claims is not in proper Markush format. See MPEP 2173.05(h). This can be corrected by inserting the words --the group consisting of-- should be inserted after the word "from" or by changing "and" to --or--. Appropriate correction is required.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 31 and 33 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

4. Claims 31 and 33 recite the limitation "the bipolar plate" in line 2. There is insufficient antecedent basis for this limitation in the claim. Since claim 27 defines two different bipolar plates, Applicant should amend claims 31 and 33 to depend from claim 27 and to recite which bipolar plate is referred to in each claim.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

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6. Claims 1-3 and 18 are rejected under 35 U.S.C. 102(b) as being clearly anticipated by Furuya (JP 02-054790).

Furuya anticipates the invention as claimed. Furuya teaches (see English abstract, Derwent abstract and figure 2) an apparatus comprising a porous anode in communication with hydrogen gas, a porous cathode in communication with nitrogen gas and an electrolyte disposed within a matrix that is located between the anode and cathode.

Regarding claims 2 and 3, Furuya teaches (see English abstract) a catalyst disposed on the anode and cathode on the sides facing the electrolyte.

Regarding claim 18, the nitrogen gas is reduced at the cathode to produce the negatively charged nitrogen-containing species in the electrolyte (from the electrolysis) (see abstract). Thus, the electrolyte supports migration of the negatively charged nitrogen-containing species between the cathode and the anode.

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

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1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

9. Claims 4-6, 13 and 15-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Furuya (JP 02-054790).

The teachings of Furuya are described above in paragraph no. 6.

Regarding claims 4 and 5, the porous anode of Furuya inherently has a pore size. Although not disclosed, the anode porosity is a result-effective variable (effecting gas flow through rate) and one skilled in the art has the skill to calculate the porosity that would determine the success of the desired reaction to occur, e.g., passing enough hydrogen gas through the electrode in order to react with the nitrogen to produce the product, absent evidence to the contrary. MPEP 2141.03 and 2144.05(b).

Regarding claim 6, Furuya teaches (see English abstract) that there is a catalytic metal (platinum) membrane attached to the porous anode facing the electrolyte. However, Furuya does not teach the thickness of this membrane. Yet, it would have been within the expected skill of a routineer in the art to have optimized the thickness of the membrane to achieve proper transfer of electrons and hydrogen atoms to the electrolyte.

Regarding claim 13, Furuya teaches (see English abstract) disposing a catalyst on the surface of the metal membrane facing the electrolyte.

Regarding claim 15 and 16, Furuya teaches (see English abstract) that the

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cathode comprises fine metal particles. It would have been obvious to the artisan to have used nickel metal particles because it would have been doing the same endeavor of acting as a gas diffusion material, absent evidence to the contrary.

Regarding claim 17, the porous cathode of Furuya inherently has a pore size. Although not disclosed, the pore size is a result-effective variable (effecting gas flow through rate) and one skilled in the art has the skill to calculate the pore size that would determine the success of the desired reaction to occur, e.g., passing enough nitrogen gas through the electrode in order to react with the hydrogen to produce the product, absent evidence to the contrary. MPEP 2141.03 and 2144.05(b).

10. Claims 6-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Furuya (JP 02-054790) in view of Hartner et al (US 3,393,098).

Regarding claim 6, Furuya is silent as to the formation of a metal membrane on the porous anode.

Hartner et al teach (see col. 4, lines 39-53 and line 67 to col. 5, line 3) adding a metal (Pd) layer onto an electrode to provide a hydrogen diffusion membrane thus preventing other gases from passing through the electrode. The metal layer is 12.7-762 microns thick.

Therefore, it would have been obvious to one of ordinary skill in the art to have used the metal membrane of Hartner et al on the reaction side of the porous anode in the cell of Furuya JP because the Pd metal membrane prevents other gases from passing through, thus ensuring a more pure reaction product.

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Regarding claim 7, Hartner et al teach (see col. 4, lines 39-53) that Pd provides the best hydrogen diffusion membrane.

Regarding claims 8-10, the use of the claimed matrix for supporting the metal membrane is merely a matter of design choice because the design solves no stated problems and produces no unexpected results, absent evidence to the contrary. *In re Kuhle* 188 USPQ 7 (CCPA 1975).

Regarding claim 11, it would have been obvious to one of ordinary skill in the art to have added a second Pd membrane on the opposite side of the porous anode in order to add more purity restrictions on the gas (ions) passing through the electrolyte. It would have been obvious to the artisan to have used a non-noble metal as the porous anode because such are conventional (see e.g.-Bacon (US 2,716,670), which teaches a porous nickel electrode), absent evidence to the contrary.

Regarding claim 12, it would have been obvious to the artisan to have used iron, tantalum or lathanide metals as the porous anode because porous tantalum anodes are conventional (see e.g.-Yano et al (US 3,647,415), which teaches a porous tantalum anode which has low DC leakage and high breakdown voltage), absent evidence to the contrary.

Regarding claim 13, Furuya teaches (see English abstract) disposing a catalyst (Pt) on the surface of the porous anode facing the electrolyte.

Regarding claim 14, platinum and ruthenium (both members of the platinum group metals) were considered to be functional equivalents in terms of catalytic activity.

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Therefore, it would have been obvious to one of ordinary skill in the art to have substituted Ru for the Pt of Furuya.

11. Claims 26-36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Furuya (JP 02-054790) in view of Turner et al (US 5,584,981).

The teachings of Furuya are described above in paragraph no. 6.

Furuya does not teach a plurality of electrolytic cells.

Turner et al teach (see Figure 6) a scheme for setting up multiple electrolytic cells that includes an anodic fluid flowfield (86) and a cathodic fluid flowfield (81).

Therefore, it would have been obvious to one of ordinary skill in the art to have used the multiple electrolytic cell set-up of Turner et al for the cell of Furuya because the multiple cells allow for larger production capacity.

Regarding claim 27, it would have been within the expected skill of a routineer in the art to have added a bipolar plate between each of the individual cells (i.e.-one on the opposite side of the anodic fluid flowfield and one on the opposite side of the catholytic fluid flowfield) to provide for easy separation between each cell.

Regarding claims 28 and 29, it would have been within the expected skill of a routineer in the art to provide conventional manifolds, such as internal or external manifolds, for distributing the hydrogen and nitrogen to each of the flowfields.

Regarding claim 30, it would have been within the expected skill of a routineer in the art to have made the porous anode and cathode from conventional materials, such as by sintering metal particles (see e.g. Bacon (US 2,716,670) at col. 3, lines 14-20).

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Regarding claims 31-35, it would have been within the expected skill of a routineer in the art to have bonded the parts of the electrolytic cell by conventional means, such as welding.

Regarding claim 36, it would have been within the expected skill of a routineer in the art to have made the porous cathode from metal carbides because it was well known in the art that such cathodes were catalytic in the reaction of gases (for support see Beccu et al (US 3,753,782) at col. 2, lines 45-51).

Allowable Subject Matter

12. Claims 19-25 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

13. The following is a statement of reasons for the indication of allowable subject matter: regarding claims 19-25, Furuya teaches (see abstract) an electrolyte solution. Thus, Furuya fails to teach the claimed feature of a molten electrolyte. It would not have been obvious to change the electrolyte from a solution to a molten salt.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Harry D Wilkins, III whose telephone number is 703-305-9927. The examiner can normally be reached on M-Th 10:00am-8:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Roy V King can be reached on 703-308-1146. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

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Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.

hdw

Harry D Wilkins, III
Examiner
Art Unit 1742

ROY KING
SUPERVISORY PATENT EXAMINER
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